ENU 4003 | Nuclear Engineering Analysis 2

Class Number: 21435

Instructor Information

Name: Christopher McDevitt

Course Details

Catalog Description: A continuation of ENU 4001. Nuclear application contents: finite diff./geometries, numerical methods, differential equations and solution methods of relevance to nuclear problems, basic AI-components.
Pre- and Co-Requisites: Prereq: ENU 4001 with a minimum grade of C.
Credit Hours: 4
Course Fees: $0.00

Required Materials

FOUNDATIONS IN APPLIED NUCLEAR ENGINEERING ANALYSIS (2ND EDITION)
ISBN: 9789814630931
Authors: GLENN E. SJODEN
Publisher: WORLD SCIENTIFIC
Edition: SECOND EDITION

Recommended Materials

ADVANCED ENGINEERING MATHEMATICS
ISBN: 0470458364
Authors: ERWIN KREYSZIG
Publisher: WILEY
Edition: 10TH

Course Goals and Objectives

This course consists of four one-hour lectures discussing continuous and discrete variable solution methods for the statistical, algebraic, differential and integral equations important in Nuclear Engineering. Problems involving neutron, photon, fluid and temperature distributions in configuration, time and velocity are mathematically modeled, solved and interpreted.

Expectations and Student Learning Outcomes

1. Students will solve continuous and discrete variable equations, including ordinary differential equations, partial differential equations, and systems of equations, using applicable analytical and numerical solution methods.
2. Students will model and interpret mathematically the distributions of neutrons and temperatures across varying configurations.
3. Students will apply advanced mathematical concepts, including vectors, matrices, and Fourier series, to organize and analyze complex systems in nuclear engineering.
4. Students will identify, formulate, and solve complex engineering problems by integrating principles of engineering, science, data science, and mathematics.

Methods of Evaluation

Grade weight

Assignment	Percentage of Final Grade
Homework Sets	20%
Exam 1	25%
Exam 2	25%
Final Exam	30%
	100%

Homework: Homework assignments will be posted on Canvas. There will be roughly five homework sets during the course. Homework should be submitted electronically via the Canvas website only. Students may work in groups, though each student should submit their own homework assignment. Late homework assignments will be penalized by 20% per day until solutions are posted.

Midterm exams: Two midterm exams will be given during the semester. These exams will be administered during the normal class time. I will provide roughly one week of advanced notice.

Final exam: A cumulative exam will be given during finals week. This exam will be closed book, though one sheet (both sides) of handwritten notes will be permitted during the exam.

Grading Scale

Letter grade and percentage

Letter	Percentage Value
A	92 - 100%
A -	88 - 91.9%
B +	84 - 87.9%
B	80 - 83.9%
B -	76 - 79.9%
C +	72 - 75.9%
C	68 - 71.9%
C -	64 - 67.9%
D +	60 - 63.9%
D	56 - 59.9%
D -	52 - 55.9%
E	51.9% and below

Course Schedule

Week 1: Review of Selected Topics Chaps. 1-4

Week 2: Ordinary Differential Equations Chap. 5

Week 3: Non-Homogeneous Solution Methods Chap. 5 HW1

Week 4: Solving Differential Equations with Variable Coefficients Chap. 7

Week 5: Vectors and Matrices Chap. 8

Week 6: Solving a System of Equations Chap. 8 HW2 Exam 1

Week 7: Gram-Schmidt Orthogonalization and Fourier Series Chap. 9

Week 8: Applied Methods and PDEs Chap. 10 HW3

Week 9: Applications: Heat Transfer Chap. 11

Week 10: Applications: Nuclear Heat Transfer I Chap. 12

Week 11: Applications: Nuclear Heat Transfer II Chap. 12 HW4 Exam 2

Week 12: Applications: Neutronics Chap. 13

Week 13: Data Science I Instructor notes

Week 14: Data Science II Instructor notes

Week 15: Class wrap and Review HW5

University Policies and Resources

Information about grading policies, support for students with disabilities, course evaluations, the Honor Code, and other course policies and campus resources can be found on the Syllabus Policies page.

Attendance Policy

Excused and Unexcused Absences

Students may only participate in classes if they are registered officially or approved to audit with evidence of having paid audit fees. The Office of the University Registrar provides official class rolls to instructors.

Students are responsible for satisfying all academic objectives as defined by the instructor. Absences count from the first-class meeting.

Acceptable reasons for absence from or failure to engage in class include illness; Title IX-related situations; serious accidents or emergencies affecting the student, their roommates, or their family; special curricular requirements (e.g., judging trips, field trips, professional conferences); military obligation; severe weather conditions that prevent class participation; religious holidays; participation in official university activities (e.g., music performances, athletic competition, debate); and court-imposed legal obligations (e.g., jury duty or subpoena). Other reasons (e.g., a job interview or club activity) may be deemed acceptable if approved by the instructor.

For all planned absences, a student in a situation that allows an excused absence from a class, or any required class activity must inform the instructor as early as possible prior to the class. For all unplanned

absences because of accidents or emergency situations, students should contact their instructor as soon as conditions permit.

Students shall be permitted a reasonable amount of time to make up the material or activities covered during absence from class or inability to engage in class activities because of the reasons outlined above.

If a student does not participate in at least one of the first two class meetings of a course or laboratory in which they are registered, and they have not contacted the department to indicate their intent, the student can be dropped from the course. Students must not assume that they will be dropped, however. The department will notify students if they have been dropped from a course or laboratory.

The university recognizes the right of the instructor to make attendance mandatory and require documentation for absences (except for religious holidays), missed work, or inability to fully engage in class. After due warning, an instructor can prohibit further attendance and subsequently assign a failing grade for excessive absences.

Religious Holidays Guidelines

At the University of Florida, students and faculty work together to allow students the opportunity to observe the holy days of their faith. A student should inform the faculty member of the religious observances of their faith that will conflict with class attendance, with tests or examinations, or with other class activities prior to the class or occurrence of that test or activity. The faculty member is then obligated to accommodate that particular student's religious observances. Because students represent a myriad of cultures and many faiths, the University of Florida is not able to assure that scheduled academic activities do not conflict with the holy days of all religious groups. Accordingly, individual students should make their need for an excused absence known in advance of the scheduled activities.

The Florida Board of Education and state law govern university policy regarding observance of religious holidays.

Guidelines

- Students, upon prior notification to their instructors, shall be excused from class or other scheduled academic activity to

observe a religious holy day of their faith.
- Students shall be permitted a reasonable amount of time to make up the material or activities covered in their absence.
- Students shall not be penalized due to absence from class or other scheduled academic activity because of religious observances.

If a faculty member is informed of or is aware that a significant number of students are likely to be absent from class because of a religious observance, the faculty member should not schedule a major exam or other academic event at that time.

A student who is to be excused from class for a religious observance is not required to provide a second party certification of the reason for the absence. Furthermore, a student who believes that they have been unreasonably denied an education benefit due to religious beliefs or practices may seek redress through the student grievance procedure.

Absence due to Illness

A student who is absent from class or any required class-related activity because of illness should contact their instructor, if feasible, as early as possible prior to the missed class or activity.

Students shall be permitted a reasonable amount of time to make up the material or activities covered during an excused absence.

Students should contact their college by the deadline to drop a course for medical reasons. Students can petition the Dean of Students Office to drop a course for medical reasons. The university's policy regarding medical excuse from classes is maintained by the Student Health Care Center.

Twelve-Day Rule

Students who participate in university-sponsored athletic or scholarly activities are permitted to be absent 12 scholastic days per semester without penalty. A scholastic day is any day on which regular class work is scheduled as defined in the approved university calendar. More Info

The student or student's advisor must notify the instructor as early as possible prior to the anticipated absence to allow ample time for accommodations. Instructors must be flexible and not penalize students when re-scheduling during-term and final exams, class assignments, and

other required activities and must follow the UF Attendance Policy herein and UF Examination Policies. As noted in the UF Examination Policies, during-term exams should be re-scheduled no later than before the end of the semester, while final exams no later than 90 days after the originally scheduled exam time. However, instructors are encouraged to re-schedule final and during-term exams, assignments, and other activities as soon as possible after the last day of the absence and must not penalize the student in any way. More Info

A group's schedule that requires absence of more than 12 scholastic days should be adjusted so that no student is absent from campus more than 12 scholastic days. Students who previously have been warned in writing by their instructor about the impact of absences on their individual class performance should not incur additional absences, even if they have not been absent 12 scholastic days. The student is responsible to maintain satisfactory academic performance and attendance.

Late and Make Up Work Policy

Makeup exams will be offered for excused absences. Students should inform the instructor as far in advance as possible if he/she will be unable to take an exam at the scheduled time.